(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 661 015 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **94203770.6**

(51) Int. Cl.[6]: **A47B 77/04**, A47B 51/00

(22) Date of filing: **27.12.94**

(30) Priority: **28.12.93 NL 9302279**

(43) Date of publication of application:
05.07.95 Bulletin 95/27

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

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(54) Adjustment mechanism for a wall element.

(57) An adjustment mechanism for adjusting the height of an element, for example a work surface, a sink unit, a cupboard, a wall part or the like, comprises

at least two vertical guides disposed at horizontal mutual distance;

a first and a second support for connecting to the element and each movable along a guide;

a third support for connecting to the element and movable along a vertical guide, which support has a vertical distance relative to at least one of the first and second support; and

drive means connected to control means for adjusting the height of the element.

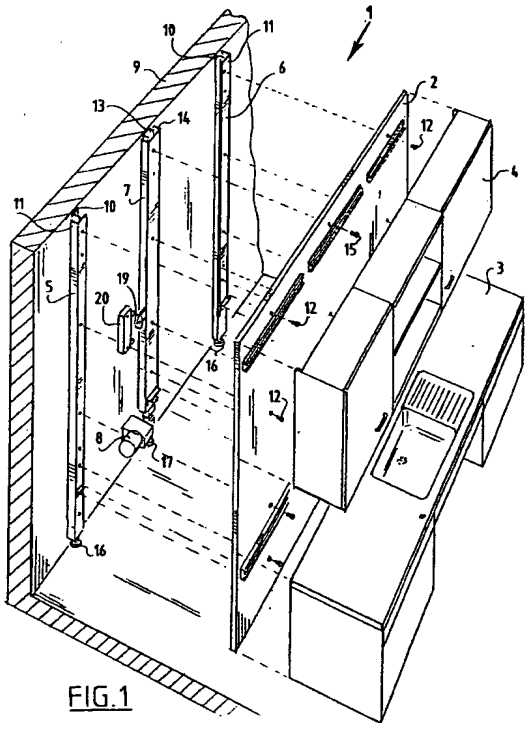

FIG.1

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The invention relates to a device for adjusting the height of an element, for example a work surface, a sink unit, a cupboard, a wall part or the like.

A height-adjustable work surface is important for various groups of users. A need is particularly felt by elderly and disabled people for a sink unit or draining board for placing in a kitchen, the height of which can be adapted in simple manner to the specific requirements of the user.

It is the object of the invention to provide such a device.

Another object of the invention is to provide such a device which complies with high standards of reliability, which is inexpensive to purchase and simple to mount and operate. Such a device must be able to operate with one drive, without there being a danger of tilting occurring in the case of asymmetrical load and drive.

For the realization of this and other objectives the invention provides an adjustment mechanism which comprises

at least two vertical guides disposed at horizontal mutual distance;

a first and a second support for connecting to the element and each movable along a guide;

a third support for connecting to the element and movable along a vertical guide, which support has a vertical distance relative to at least one of the first and second support; and

drive means connected to control means for adjusting the height of the element.

It is recommended to cause the driving to take place such that the up and downward movable element is in balance.

In an embodiment of a device according to the invention the respective supports are therefore connected to the element at locations which are situated on the structure substantially in accordance with the vertices of an isosceles triangle with a horizontal base.

A device with supports connected in such manner can be embodied with light and inexpensive materials, wherein a drive of small power can suffice, without detracting from the reliability and the durability of the device.

In a preferred embodiment the device is characterized by two supports movable along the first and two supports movable along the second guide, which are connected to the element at locations which are situated on that element substantially in accordance with the vertices of a rectangle.

An element connected to the guides at four points can be propelled very lightly along these guides. Particularly when the vertices of the rectangle formed by the four locations are far apart, wherein the maximum dimensions are determined by the dimensions of the adjustable structure, the element is prevented from performing a tilting movement during adjustment.

In an advantageous embodiment of an adjustable device a guide comprises a rod along which a support is movably arranged.

By way of example the support is block-shaped and is provided with a bore through which the rod extends.

In an alternative embodiment a support comprises a rod which is arranged movable along the guide.

In an embodiment a guide comprises two profiles movable vertically relative to each other, whereof a first profile is disposed fixedly and the second profile is coupled to the support.

Such a guide has the advantage that the coupling of the height-adjustable element to for instance a wall can be effected in simple, rapid and thus inexpensive manner.

Coupling such a guide to for example a wall is simplified still further when the first profile supports for example on the floor of the space with an adjusting screw coupled to that profile.

With such a guide the height of the first profile for coupling fixedly to the wall is first adjusted precisely using the adjusting screw, whereafter the profile can be fixed to the wall.

In advantageous embodiments of the guide in a device according to the invention at least one profile is an angle profile or a U-profile.

Both an angle profile and a U-profile can be fixed with one side to a fixed wall or a movable wall as desired, while elements are fixed to another side of the angled or U-profile for coupling to a second profile movable relative to the first.

The device according to the invention can comprise hydraulic, pneumatic or mechanical drive means.

In an embodiment of a device with mechanical drive means according to the invention the third guide comprises a screw spindle which is coupled to the respective support and fixed relative thereto and which co-acts with a rotatable nut fixed in height direction.

In an alternative embodiment the third guide comprises a rotatable nut which is coupled to the respective support and which co-acts with a non-rotatable screw spindle fixed in height direction.

In another alternative embodiment the third guide comprises a rotatable screw spindle which is coupled to the respective support and fixed in lengthwise direction relative thereto and which co-acts with a non-rotatable nut fixed in height direction.

In yet a further alternative embodiment the third guide comprises a nut which is coupled to the respective support and fixed relative thereto and which co-acts with a rotatable screw spindle fixed

in height direction.

According to the invention an electric motor is provided for rotation of the nut or the screw spindle.

A preferred embodiment of an adjustable device according to the invention has the feature that this comprises at least one flexible transport conduit for water, gas or electricity.

A flexible transport conduit offers the option of fixing to the adjustable structure apparatus or appliances which depend for their functioning on the supply of gas or electricity or the supply or drainage of water.

The invention will be further elucidated hereinbelow on the basis of embodiments with reference to the drawing.

In the drawing:

figure 1 shows a perspective view of a height-adjustable kitchen according to the invention,

figure 2 shows the kitchen of figure 1 in a rear view,

figure 3 is a perspective view of a detail of the drive of figure 2,

figure 4 is a perspective view of a detail of the middle guide of figure 2, and

figure 5 shows a perspective view of a detail of the left-hand side guide of figure 2.

Figure 1 shows an adjusting device 1 with a height-adjustable rear wall 2, to which a sink unit 3 and wall cupboards 4 are fixed. The rear wall 2 is coupled to and movable along a first guide 5, a second guide 6, and a third guide 7 which in turn are each connected to the fixed wall 9. Both side guides 5, 6 each consist of an angle profile 10 fixed to the wall 9 and an angle profile 11 which is connected by means of bolts 12 to the height-adjustable rear wall 2 and which is movable in the lengthwise direction relative to the fixed angle profile 10. The middle guide 7 contains a U-profile 13 fixed to the wall 9 and a U-profile 14 which is connected by means of bolts 15 to the rear wall 2 and which is movable in lengthwise direction relative to the fixed U-profile 13.

The movable U-profile 14 and the rear wall 2 connected thereto are driven by an electric motor 8, wherein a finger 19 connected to the movable U-profile 14 actuates a limit switch 20. In mounting the fixed angle profiles 10 and the fixed U-profile 13 on the wall 9, use is made of adjusting screws 16, 17 connected to these profiles.

Figure 2 shows the kitchen according to figure 1 in rear view, wherein the reference numerals elucidated in figure 1 have the same designation. Figure 2 further shows an upper block-shaped guide element 21 which is arranged in the top part of each of the side guides 5, 6 and coupled to the respective fixed angle profile 10, in which element is movably received a rod 22 connected to the respective movable angle profile 11. In the underside of each of the side guides 5, 6 is arranged a lower block-shaped guide element 23 which is connected to the respective fixed angle profile 10 and in which a rod 42 connected to the movable angle profile 11 is again movably received. Accommodated in the middle guide 7 are two combinations, designated with an arrow 4, of a guide element with a rod received therein.

Figure 2 further shows a rotatable screw spindle 25 driven by the electric motor 8 and received in a spindle nut 24 fixedly connected to the fixed U-profile.

The coupling of the movable wall 2 to the first 5 and the second guide 6 and the drive means 8 is effected in figure 2 using the upper guide blocks 21 and the spindle nut 24, wherein the guide elements and the spindle nut 24 are situated on the rear wall 2 substantially as according to the vertices of an isosceles triangle with a horizontal base. The dimensions of this triangle are determined by the dimensions of the rear wall 2, and in the example of figure 2 are maximal, which ensures a maximum stability of the wall 2 guidable along the guides 5, 6, 7. In the same embodiment the upper block-shaped guide elements 21 and the lower block-shaped guide elements 23 are situated on the rear wall 2 substantially in accordance with the vertices of a rectangle, wherein the dimensions of the rectangle are again determined by the dimensions of this rear wall 2 and, in the example of figure 2, are again the maximum, which again provides an extremely stable configuration of adjustable wall 2 and guides 5, 6, 7.

Figure 3 shows an enlarged perspective view of the detail of figure 2 indicated by the arrow III. In the figure previously stated reference numerals refer to the components mentioned. The figure shows how the fixed U-profile 13 is fixed to the wall 9 with bolts 26. A bottom 29 and a top bearing housing 30 are connected to the fixed U-profile 13 with bolts 31 and 32 respectively. Accommodated in the bearing housings 29, 30 are bearings 27, 28 in which a screw spindle shaft 25 is received rotatably. The screw spindle 25 co-acts with a nut 24 which is again fixedly connected to the movable U-profile 14. The screw spindle 25 is set into rotation by the motor 8 which is coupled to the screw spindle via tooth wheels 35, 33 and a chain 34. The motor 8 is mounted on the fixed U-profile 13 using a suspension 36. The figure further shows a horizontal angle profile 46 which is fixed to the vertical movable U-profile 14 and on which the movable wall 42 rests.

Figure 4 shows the detail of the middle guide 7 indicated by the arrows IV in figure 2. Shown here is how a guide block 37 is connected using bolts 38 to the fixed U-profile 13 which in turn is an-

chored to the wall 9, again with bolts 41. Movably received in the guide block 37 is a rod 39 which is clamped by retaining blocks 40 which are again connected to the movable U-profile 14 to which the movable wall 2 is again fixed.

Figure 5 shows a detail of the left-hand side guide of figure 2 indicated with arrow V. To the wall 9 is fixed the fixed angle profile 10 after the height thereof is adjusted using an adjusting screw 16 which co-acts with the nut 43 fixedly connected to the angle profile 10. Likewise fixedly connected to the angle profile 10 with bolts 44, the block 23 movably receives a rod 42, which rod 42 is clamped between retaining blocks 40 which are connected, again using bolts, to the movable angle profile 14 to which the movable wall 2 is again fixed.

The height over which the wall can be varied is determined in the embodiment of figures 1 to 5 by the limit switch 20 in figure 1, but is of course smaller than the length of the thread on the screw spindle 25 in figure 3 and the distance between the retaining blocks in figures 4 and 5. In a practical situation the height variation is for example 150 mm. The screw spindle is driven for example at a rotation speed of 15 revolutions per minute by a simple electric motor with low power of for example 50 Watts.

It is noted that the above described embodiments are given by way of elucidating the invention, but that they in no way limit the scope of the invention. Instead of a combination of screw spindle and spindle nut driven by an electric motor the drive means for height adjustment of wall 2 can also comprise for example a device operating on water pressure, for example when the adjustable wall supports a sink unit wherein a water supply line is already provided. The drive means can in principle engage at any desired horizontal position.

In the embodiments shown the two vertical guides disposed at a mutual horizontal distance comprise two supports in each case. It is noted that one support can suffice per guide when this support has a sufficient dimension in vertical direction.

Claims

1. Device for adjusting the height of an element, for example a work surface, a sink unit, a cupboard, a wall part or the like, which device comprises:

   at least two vertical guides disposed at horizontal mutual distance;

   a first and a second support for connecting to the element and each movable along a guide;

   a third support for connecting to the element and movable along a vertical guide, which support has a vertical distance relative to at least one of the first and second support; and

   drive means connected to control means for adjusting the height of the element.

2. Device as claimed in claim 1, **characterized in that** the respective supports are connected to the element at locations which are situated on that element substantially in accordance with the vertices of an isosceles triangle with a horizontal base.

3. Device as claimed in claim 1 or 2, **characterized by** two supports movable along the first and two supports movable along the second guide, which are connected to the element at locations which are situated on that element substantially in accordance with the vertices of a rectangle.

4. Device as claimed in any of the claims 1-3, **characterized in that** a guide comprises a rod along which a support is arranged movably.

5. Device as claimed in any of the claims 1-3, **characterized in that** a support comprises a rod which is arranged movably along the guide.

6. Device as claimed in claim 4, **characterized in that** the support is block-shaped and is provided with a bore through which the rod extends.

7. Device as claimed in any of the claims 1-6, **characterized in that** a guide comprises two profiles movable vertically relative to each other, whereof a first profile is fixedly disposed and the second profile is coupled to the support.

8. Device as claimed in claim 7, **characterized in that** the first profile is supportable on its underside by an adjusting screw coupled to that profile.

9. Device as claimed in claim 7, **characterized in that** at least one profile is an angle profile.

10. Device as claimed in claim 7, **characterized in that** at least one profile is a U-profile.

11. Device as claimed in claim 1, **characterized by** hydraulic drive means.

12. Device as claimed in claim 1, **characterized by** pneumatic drive means.

13. Device as claimed in claim 1, **characterized by** mechanical drive means.

14. Device as claimed in claim 13, **characterized in that** the third guide comprises a screw spindle which is coupled to the respective support and fixed relative thereto and which co-acts with a rotatable nut fixed in height direction.

15. Device as claimed in claim 13, **characterized in that** the third guide comprises a rotatable nut which is coupled to the respective support and which co-acts with a non-rotatable screw spindle fixed in height direction.

16. Device as claimed in claim 13, **characterized in that** the third guide comprises a rotatable screw spindle which is coupled to the respective support and fixed in lengthwise direction relative thereto and which co-acts with a non-rotatable nut fixed in height direction.

17. Device as claimed in claim 13, **characterized in that** the third guide comprises a nut which is coupled to the respective support and fixed relative thereto and which co-acts with a rotatable screw spindle fixed in height direction.

18. Device as claimed in claim 14 or 15, **characterized by** an electric motor for rotation of the nut.

19. Device as claimed in claim 16 or 17, **characterized by** an electric motor for rotation of the screw spindle.

20. Device as claimed in any of the foregoing claims, **characterized in that** this comprises at least one flexible transport conduit for water, gas or electricity.

21. Device as claimed in any of the foregoing claims, **characterized in that** at least one of the supports extends in vertical direction over a substantial part of the element.

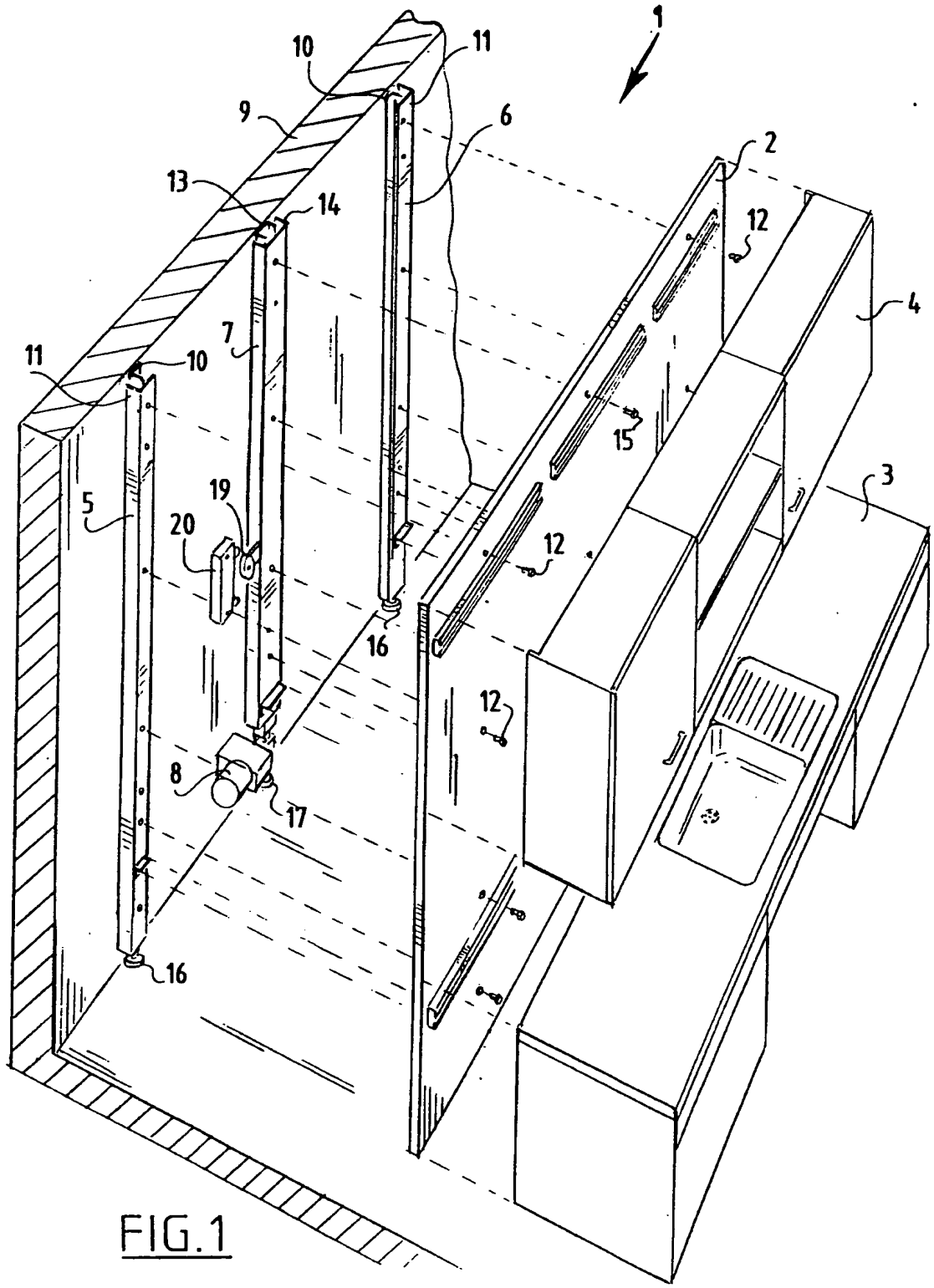

FIG.1

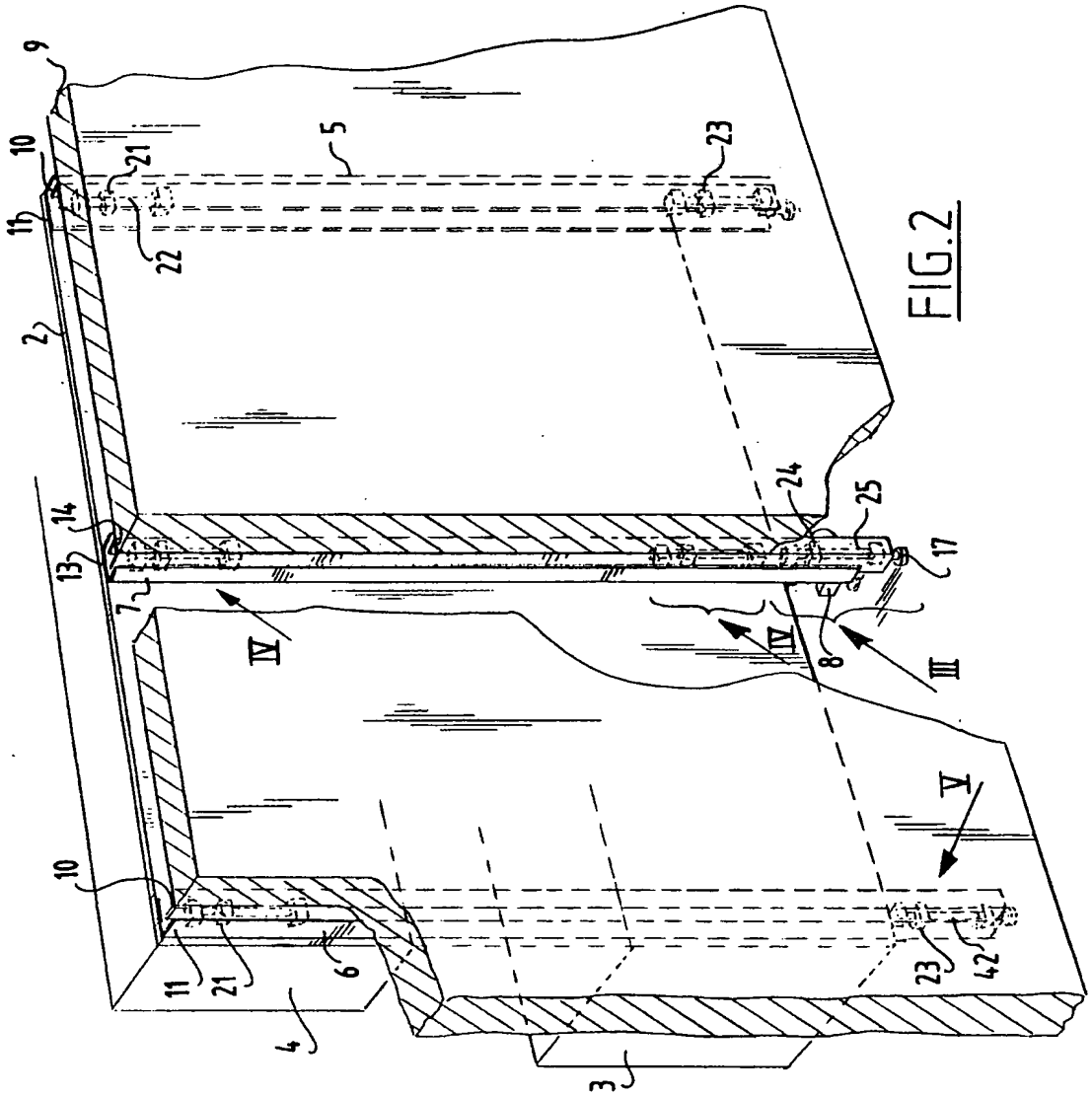

FIG.2

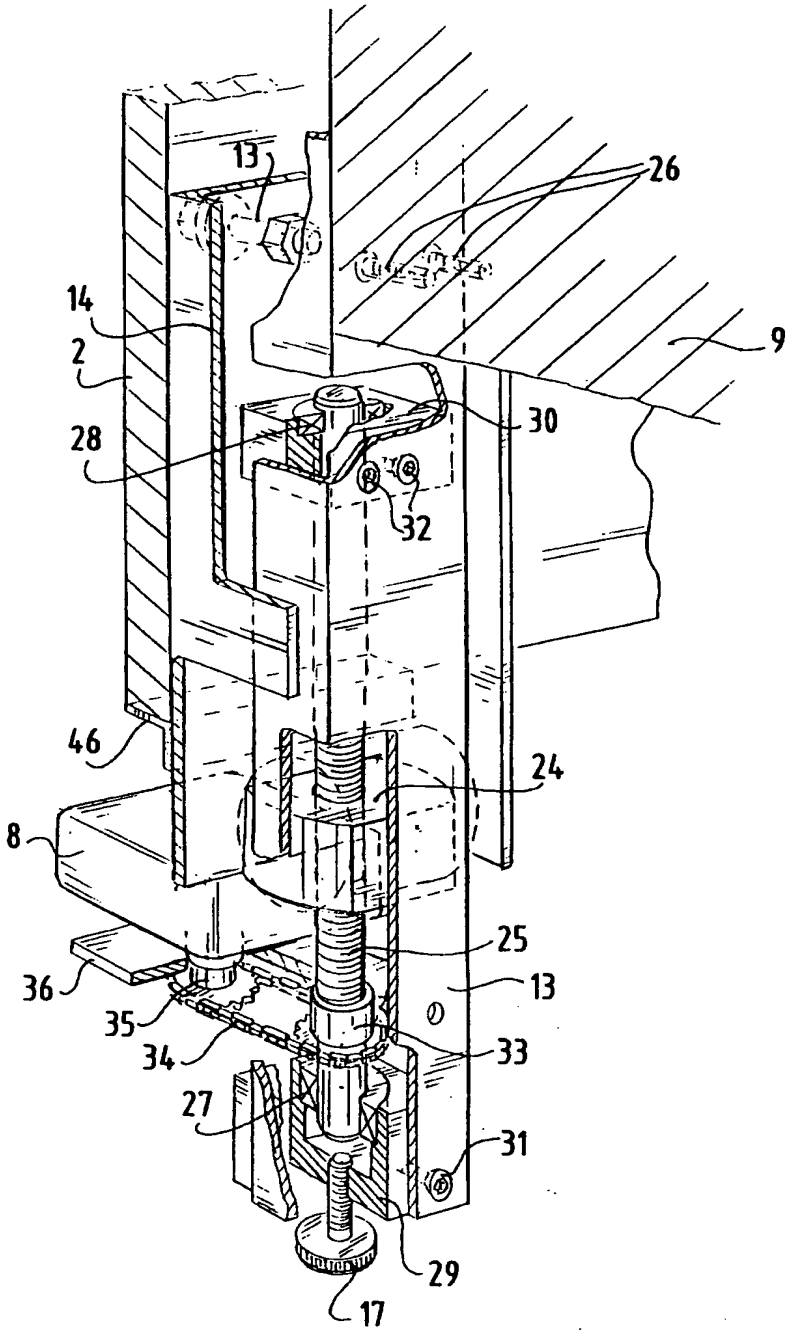

FIG.3

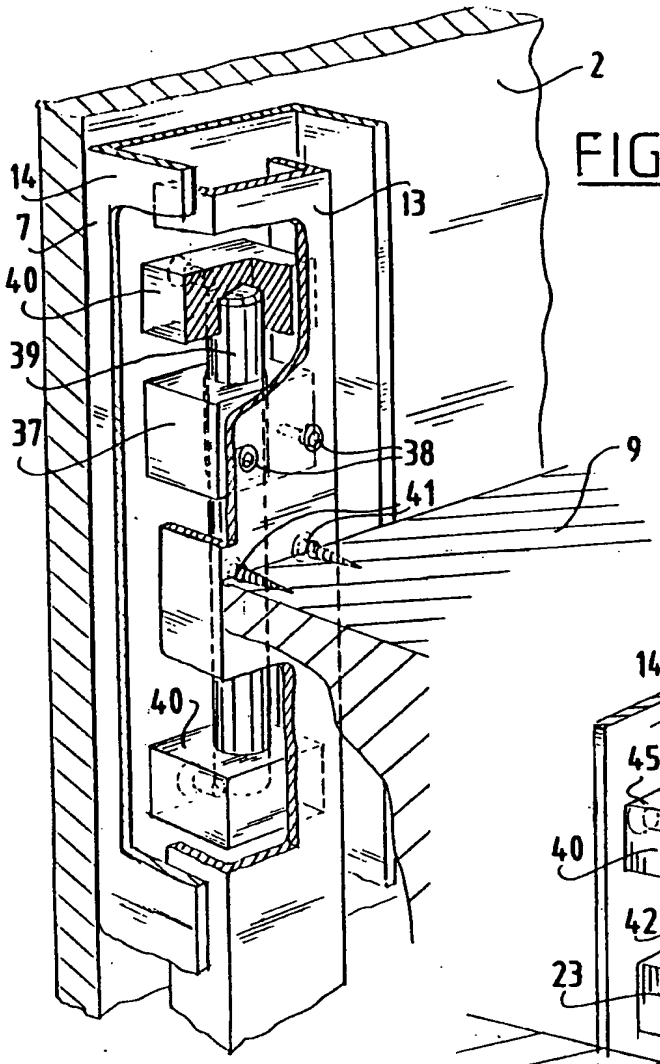

FIG.4

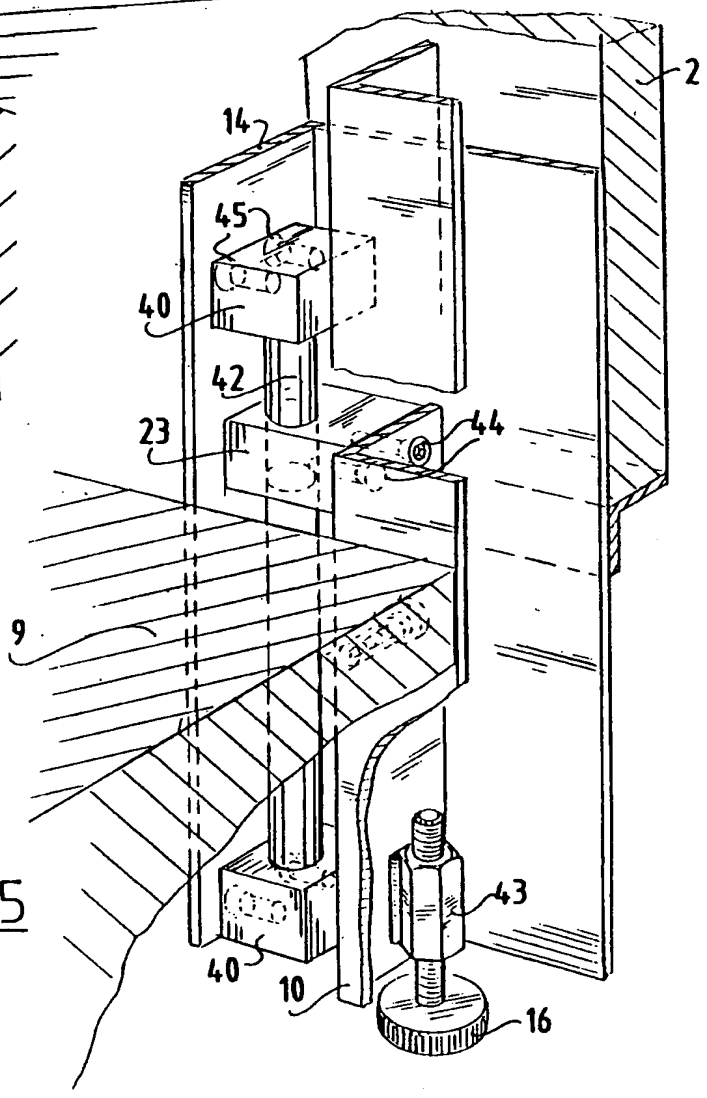

FIG.5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 20 3770

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	US-A-2 854 307 (LONDEREE ET AL.) * column 2, paragraph 2; figures 3-6 * * column 3, line 28 - column 4, line 3 *	1,2,4-7, 11,12 3,8,13, 17,19	A47B77/04 A47B51/00
X	GB-A-2 061 700 (ANTHONY) * page 2, line 5 - line 33; figures 3,4,6-9 *	1,2,5,7, 11,12, 20,21	
Y	US-A-2 854 308 (HARRIS) * column 3, line 33 - line 46; figures 1,3,4,6 * * column 4, line 15 - line 45 *	3,8,13, 17,19	
A	US-A-4 616 887 (OUDMAN) * column 2, line 28 - line 49; figure 3 *	3	
A	FR-A-2 692 119 (GREZE A.) * figures 1,3,4 *	9,10	TECHNICAL FIELDS SEARCHED (Int.Cl.6) A47B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 March 1995	Jones, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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